

## SECTION

## 2

Math

25 minutes

1. (A) (B) (C) (D) (E)
2. (A) (B) (C) (D) (E)
3. (A) (B) (C) (D) (E)
4. (A) (B) (C) (D) (E)
5. (A) (B) (C) (D) (E)
6. (A) (B) (C) (D) (E)
7. (A) (B) (C) (D) (E)
8. (A) (B) (C) (D) (E)

9. (A) (B) (C) (D) (E)
10. (A) (B) (C) (D) (E)
11. (A) (B) (C) (D) (E)
12. (A) (B) (C) (D) (E)
13. (A) (B) (C) (D) (E)
14. (A) (B) (C) (D) (E)
15. (A) (B) (C) (D) (E)
16. (A) (B) (C) (D) (E)

17. (A) (B) (C) (D) (E)
18. (A) (B) (C) (D) (E)
19. (A) (B) (C) (D) (E)
20. (A) (B) (C) (D) (E)

Time: 25 minutes

Start: \_\_\_\_\_

Stop: \_\_\_\_\_

## SECTION

## 4

Math

25 minutes

21. (A) (B) (C) (D) (E)
22. (A) (B) (C) (D) (E)
23. (A) (B) (C) (D) (E)
24. (A) (B) (C) (D) (E)
25. (A) (B) (C) (D) (E)
26. (A) (B) (C) (D) (E)
27. (A) (B) (C) (D) (E)
28. (A) (B) (C) (D) (E)

Time: 25 minutes

Start: \_\_\_\_\_

Stop: \_\_\_\_\_

29.

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	0	0	0
1	1	1	1
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3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

30.

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4	4	4	4
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6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

31.

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6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

32.

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6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

33.

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6	6	6	6
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9	9	9	9

34.

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6	6	6	6
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9	9	9	9

35.

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36.

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9	9	9	9

37.

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6	6	6	6
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9	9	9	9

38.

.	/	/	/
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3	3	3	3
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9	9	9	9



# Section 2

Time—25 minutes

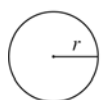
20 Questions (1–24)

## Directions for Multiple-Choice Questions

In this section, solve each problem, using any available space on the page for scratchwork. Then decide which is the best of the choices given and fill in the corresponding oval on the answer sheet.

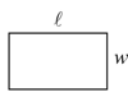
- You may use a calculator on any problem. All numbers used are real numbers.
- Figures are drawn as accurately as possible EXCEPT when it is stated that the figure is not drawn to scale.
- All figures lie in a plane unless otherwise indicated.

## Reference Information



$$A = \pi r^2$$

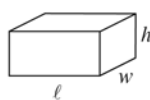
$$C = 2\pi r$$



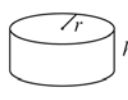
$$A = \ell w$$



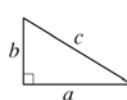
$$A = \frac{1}{2}bh$$



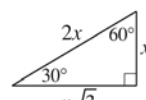
$$V = \ell wh$$



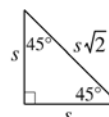
$$V = \pi r^2 h$$



$$c^2 = a^2 + b^2$$



Special Right Triangles



The arc of a circle measures  $360^\circ$ .

Every straight angle measures  $180^\circ$ .

The sum of the measures of the angles in a triangle is  $180^\circ$ .

- 1 Which of the following integers, when doubled, produces a number that is 2 greater than a multiple of 6?

(A) 5  
(B) 6  
(C) 7  
(D) 8  
(E) 9

- 3 If 4.5 zots are equivalent to 1 zat, how many zats are equivalent to 36 zots?

(A) 8  
(B) 9  
(C) 12  
(D) 16  
(E) 81

- 2 What is the circumference, in inches, of a circle with an area of  $16\pi$  square inches?

(A)  $2\pi$   
(B)  $4\pi$   
(C)  $8\pi$   
(D)  $16\pi$   
(E)  $32\pi$

4

1, 2, 1, 2, 1, 2, ...

If the sequence above continues as shown, what is the sum of the first 20 terms?

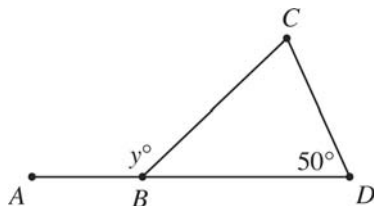
(A) 20  
(B) 30  
(C) 40  
(D) 45  
(E) 60

2

- 5** Tom's weight is 20 pounds less than twice Carl's weight. If together Tom and Carl weigh 340 pounds, how much does Tom weigh?

(A) 120 pounds  
(B) 160 pounds  
(C) 180 pounds  
(D) 200 pounds  
(E) 220 pounds

6



*Note: Figure not drawn to scale.*

In the figure above, if  $BC = BD$ , what is the value of  $y$ ?

(A) 100  
(B) 120  
(C) 125  
(D) 130  
(E) 140

7

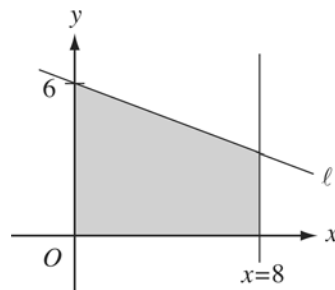
For all integers  $n$ , if  $*n$  is defined by the equation

$$*n = \begin{cases} \frac{n}{3} & \text{if } n \text{ is divisible by 3} \\ 3n & \text{if } n \text{ is not divisible by 3} \end{cases}$$

which of the following is equivalent to  $*10$ ?

(A)  $*3$   
(B)  $*9$   
(C)  $*20$   
(D)  $*30$   
(E)  $*90$

8



*Note: Figure not drawn to scale.*

In the figure above, if line  $\ell$  has a slope of  $-1/2$ , what is the area of the shaded region, in square units?

(A) 28  
(B) 32  
(C) 36  
(D) 40  
(E) 42

9

If each box of pencils contains  $x$  pencils, and if 10 boxes of pencils cost  $d$  dollars, how many dollars should it cost to buy  $50x$  pencils?

(A)  $\frac{d}{5x}$   
(B)  $\frac{x}{5d}$   
(C)  $\frac{5}{dx}$   
(D)  $5d$   
(E)  $5dx$

10

Beth had planned to run an average of 6 miles per hour in a race. She had a very good race and actually ran at an average speed of 7 miles per hour, finishing 10 minutes sooner than she would have if she had averaged 6 miles per hour. How long was the race?

(A) 6 miles  
(B) 7 miles  
(C) 18 miles  
(D) 60 miles  
(E) 70 miles

- 11** On a certain map that is drawn to scale, 1.5 centimeters is equivalent to 2 miles. If two cities are 35 miles apart, how many centimeters apart should they be on this map?

(A) 24.75  
(B) 26.00  
(C) 26.25  
(D) 45.00  
(E) 46.33

- 12** Jose needs a  $\frac{5}{8}$ -meter length of copper pipe to complete a project. Which of the following lengths of pipe can be cut to the required length with the least length of pipe left over?

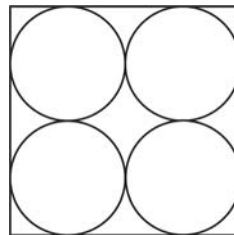
(A)  $\frac{9}{16}$  meter  
(B)  $\frac{3}{5}$  meter  
(C)  $\frac{3}{4}$  meter  
(D)  $\frac{4}{5}$  meter  
(E)  $\frac{5}{6}$  meter

- 13** If  $\frac{1}{2}a = 2b = 4c = 24$ , what is the value of  $a + b + c$ ?

(A) 24  
(B) 40  
(C) 42  
(D) 64  
(E) 66

- 14** If  $x^2 > 6$ , which of the following statements must be true?

I.  $|x| > 3$   
II.  $(x - 2)(x + 2) > 2$   
III.  $x + 1,000 > 0$   
(A) II only  
(B) I and II only  
(C) I and III only  
(D) II and III only  
(E) I, II, and III

**15**

Each of the four circles in the figure above is tangent to two sides of the square and also tangent to two of the other circles. If each circle has a circumference of  $4\pi$  inches, what is the area, in square inches, of the square?

(A) 4  
(B) 16  
(C) 24  
(D) 32  
(E) 64

**16**

$$abc + df + g$$

If the expression above is an odd number, then at most how many of the integers  $a$ ,  $b$ ,  $c$ ,  $d$ ,  $f$ , and  $g$  could be even?

(A) Two  
(B) Three  
(C) Four  
(D) Five  
(E) Six

**17**

The average (arithmetic mean) of six integers is 32. If the numbers are all different, and if none is less than 10, what is the greatest possible value of any of these integers?

(A) 127  
(B) 132  
(C) 137  
(D) 142  
(E) 147

2

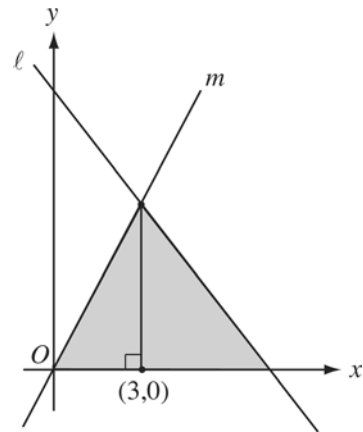
**18** If  $(\frac{1}{4})^n = 2^{-3}$ , then  $n =$

- (A)  $-\frac{3}{2}$
- (B)  $-\frac{2}{3}$
- (C)  $\frac{2}{3}$
- (D)  $\frac{3}{2}$
- (E) 3

**19** How many integers from 100 to 1,000 contain NO repeated digits? (Numbers like 252 and 991 are considered to have repeated digits.)

- (A) 632
- (B) 648
- (C) 720
- (D) 810
- (E) 900

**20**



*Note: Figure not drawn to scale.*

If line  $m$  in the figure above has a slope of 2 and the shaded triangle has an area of 24 square units, what is the slope of line  $\ell$ ?

- (A)  $-6$
- (B)  $-\frac{6}{5}$
- (C)  $-\frac{5}{6}$
- (D)  $-\frac{2}{3}$
- (E)  $-\frac{1}{3}$

**STOP**

*You may check your work, on this section only, until time is called.*

# Section 4

Time—25 minutes

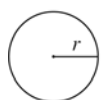
18 Questions (21–38)

## Directions for Multiple-Choice Questions

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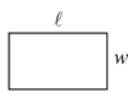
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## Reference Information



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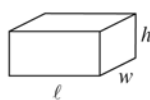
$$C = 2\pi r$$



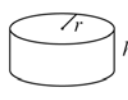
$$A = \ell w$$



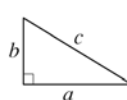
$$A = \frac{1}{2}bh$$



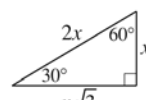
$$V = \ell wh$$



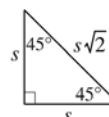
$$V = \pi r^2 h$$



$$c^2 = a^2 + b^2$$



Special Right Triangles

The arc of a circle measures  $360^\circ$ .Every straight angle measures  $180^\circ$ .The sum of the measures of the angles in a triangle is  $180^\circ$ .







**21** If  $\frac{18}{15} = \frac{x}{5}$ , then  $x =$

- (A)  $\frac{6}{5}$   
 (B) 3  
 (C)  $\frac{75}{18}$   
 (D) 6  
 (E) 54

**22** What is the height of a triangle with a base of 6 inches and an area of 24 square inches?

- (A) 12 inches  
 (B) 8 inches  
 (C) 6 inches  
 (D) 4 inches  
 (E) 2 inches

**23** Copies of *Artist's World* Magazine Sold

2002								
2003								

 = 20,000 copies

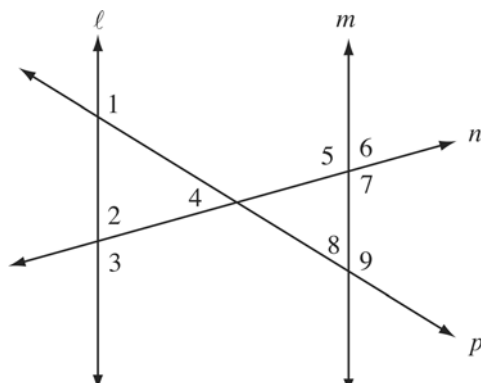
According to the chart above, how many more copies of *Artist's World* were sold in 2003 than in 2002?

- (A) 2,500  
 (B) 5,000  
 (C) 25,000  
 (D) 50,000  
 (E) 250,000

- 24** What number is 24 less than 3 times itself?

(A) 12  
(B) 24  
(C) 36  
(D) 48  
(E) 72

4

**25**

In the figure above, line  $\ell$  is parallel to line  $m$ . Which of the following pairs of angles must have equal measures?

- I. 1 and 9  
II. 2 and 8  
III. 5 and 7

(A) I only  
(B) II only  
(C) III only  
(D) I and II only  
(E) I and III only

- 26** The average (arithmetic mean) of 0,  $a$ , and  $b$  is  $2a$ . What is the value of  $b$  in terms of  $a$ ?

(A)  $a$   
(B)  $2a$   
(C)  $3a$   
(D)  $4a$   
(E)  $5a$

- 27** If  $a$ ,  $b$ , and  $c$  are integers greater than 1, and if  $ab = 21$  and  $bc = 39$ , which of the following must be true?

(A)  $a < b < c$   
(B)  $a < c < b$   
(C)  $b < a < c$   
(D)  $b < c < a$   
(E)  $c < a < b$

- 28** David, Charlene, and Rudy earned a total of \$22.00 yesterday. If Charlene earned three times as much as David did, and Rudy earned \$2.50 less than Charlene did, then how much money did Rudy earn?

(A) \$3.50  
(B) \$5.50  
(C) \$8.00  
(D) \$10.50  
(E) \$11.00



### Directions for Student-Produced Response Questions

Each of the questions in this section requires you to solve the problem and enter your answer in a grid, as shown below.

- If your answer is  $2/3$  or  $.666\dots$ , you must enter **the most accurate value the grid can accommodate**, but you may do this in one of four ways:

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- In the example above, gridding a response of  $0.67$  or  $0.66$  is **incorrect** because it is less accurate than those above.
- The scoring machine cannot read what is written in the top row of boxes. You **MUST** fill in the numerical grid accurately to get credit for answering any question correctly. You should write your answer in the top row of boxes only to aid your gridding.
- Do **not** grid in a mixed fraction like  $3\frac{1}{2}$  as 

3	1	/	2
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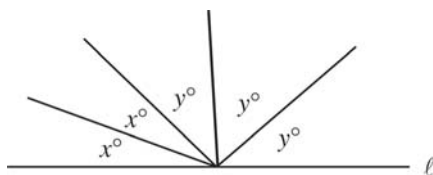
 because it will be interpreted as  $\frac{31}{2}$ . Instead, convert it to an improper fraction like  $\frac{7}{2}$  or a decimal like  $3.5$  before gridding.
- None of the answers will be negative, because there is no negative sign in the grid.
- Some of the questions may have more than one correct answer. You must grid only one of the correct answers.
- You may use a calculator on any of these problems.
- All numbers in these problems are real numbers.
- Figures are drawn as accurately as possible EXCEPT when it is stated that the figure is not drawn to scale.
- All figures lie in a plane unless otherwise indicated.

29

The ratio of 2.5 to 16 is the same as the ratio of .25 to what number?

30

For all real numbers  $x$  and  $y$ , let  $x \Delta y$  be defined by the equation  $x \Delta y = (xy) - (x + y)$ . What is the value of  $12 \Delta 6$ ?

**31**

*Note: Figure not drawn to scale.*

In the figure above, if  $x = 24$ , what is the value of  $y$ ?

**4****32**

One deck of cards consists of six cards numbered 1 through 6, and a second deck consists of six cards numbered 7 through 12. If one card is chosen at random from each deck, and the numbers on these cards are multiplied, what is the probability that this product is an even number?

**33**

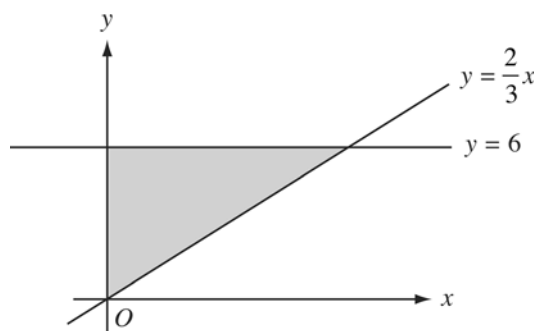
When an integer  $m$  is divided by 5, the remainder is 3. When  $m$  is divided by 7, the remainder is 1. If  $m$  is greater than 40 but less than 80, what is one possible value of  $m$ ?

**34**

If  $(2x^2 + 5x + 3)(3x + 1) = ax^3 + bx^2 + cx + d$  for all values of  $x$ , what is the value of  $c$ ?

**35**

In a sequence of numbers, each term except the first is 4 less than 4 times the previous term. If the fourth term in this sequence is 12, what is the first term?

**36**

*Note: Figure not drawn to scale.*

In the figure above, the shaded triangle is bounded by the  $y$ -axis, the line  $y = 6$ , and the line  $y = \frac{2}{3}x$ . What is the area, in square units, of the shaded triangle?

**37**

The value of  $\frac{2x + 10}{5} + \frac{3x - 2}{5}$  is how much greater than the value of  $x$ ?

**38**

If  $9\left(\frac{1}{3}\right)^n = (3^m)$ , what is the value of  $m + n$ ?

**STOP**

**You may check your work, on this section only, until time is called.**